

Customer No.: 31561
Application No: 10/709,719
Docket No.: 13114-US-PA

REMARKS

Present Status of the Application

This is a full and timely response to the outstanding non-final Office Action mailed on July 28, 2006. The Office Action has objected to claims 34 and 46. The Office action has also rejected claims 34-38, 43, 46-49 under 35 U.S.C. 102(b) as being anticipated by Kim et al. (USP 5,252,845). The Office Action has further rejected claims 39-42, 44-45, 50-51 under 35 U.S.C. 103(a) as being unpatentable over Kim in view of Hisamoto et al. (USP IEDM 91).

Claims 34-36, 38-51 remain pending of which claims 34 and 46 have been amended and claims 52-53 have been added to more accurately describe the invention. Supports for the amendments can be found in specification and the drawings, for example, from [0060] to [0065], [0072], [0081] and Figures 4 to 8, 17, 21, and 27. It is believed that no new matter is added by way of these amendments made to the claims or otherwise to the application.

Applicant has most respectfully considered the remarks set forth in this Office Action. Regarding the anticipation and obvious rejections, it is however strongly believed that the cited references are deficient to adequately teach the claimed features as recited in the presently pending claims. The reasons that motivate the above position of the Applicant are discussed in detail hereafter, upon which reconsideration of the claims is most earnestly solicited.

Customer No.: 31561
Application No: 10/709,719
Docket No.:13114-US-PA

Discussion of Office Action Rejections

The Office Action r rejected claims 34-38, 43, 46-49 under 35 U.S.C. 102 (b) as being anticipated by Kim et al. (US 5,252,845, Kim hereinafter).

It is well established that anticipation under 35 U.S.C. 102 requires each and every elements of the rejected claims to be disclosed exactly by a single prior art reference. The now-pending independent claims 34 and 46 are allowable for at least the reason that Kim fails to teach or disclose each and every feature of the now-pending independent claims 34 and 46.

In particular, claim 34 substantially teaches, among other things, "...defining an active area over the substrate to form a semiconductor pillar beside the deep trench capacitor and to form an isolation area, wherein the semiconductor pillar is formed exclusively from the substrate and the semiconductor pillar has at least three sidewalls and a top surface;...forming a word line including a multi-gate over the substrate, wherein the multi-gate is formed as a treble gate on three sidewalls of the pillar or three sidewalls and only one side edge of the top surface and is separated from the pillar by the gate dielectric layer, wherein the word line is formed covering only an edge of the pillar ...", and claim 46 substantially teaches, among other things, "...defining an active area over the substrate to form a semiconductor pillar beside the deep trench capacitor and to form an isolation area, wherein the semiconductor pillar is formed exclusively from the substrate and the pillar comprises four sidewalls and a top surface: ... :

Customer No.: 31561
Application No: 10/709,719
Docket No.: 13114-US-PA

forming a word line including a multi-gate over the substrate, wherein the multi-gate is formed as a surrounding gate that surrounds at least three of the four sidewalls of the pillar and is separated from the pillar by the gate dielectric layer...".

Kim teaches that the word lines are formed covering the entire top surface of the alleged pillar except at the bit line contacts in the center of the pillar, and two sidewalls of the alleged pillar (Please see Figure 3-4 and 6-7). The word lines of the present invention are formed covering only one side edge of the top surface of the pillar (see Figures 3-4). The central portion of the top surface and other side edge of the pillar of the instant invention is free of the word lines. Alternatively, the present invention teaches that the word lines cover only the sidewalls of the pillar, but not the top surface (see Figures 5 and 8). As further recited in claim 49, the top surface of the word line is lower than a top surface of the pillar.

Since Kim teaches that the word lines are formed covering the entire top surface of the pillar except the bit line contact at the center of the top surface and two sidewalls of the pillar, Kim fails to teach the word lines including a multi-gate, which is formed as a surrounding gate that surrounds at least three sidewalls, and in one aspect, also on only one edge side of the top surface of the pillar (see Figures 5 and 8).

For at least these reasons, Applicant respectfully asserts that Kim fails to teach or suggest the present invention or to render claims 34 or 46 anticipated. Since claims 35-36, 38-45 & claim 47-51 are dependent claims, which further define the invention recited in claims 34 and 46,

Customer No.: 31561
Application No: 10/709,719
Docket No.: 13114-US-PA

respectively, Applicant respectfully asserts that these claims also are in condition for allowance. Thus, reconsideration and withdrawal of this rejection are respectfully requested.

The Office Action rejected claims 39-42, 44-45 and 50-51 under 35 U.S.C. § 103(a) as being unpatentable over Kim in view of Hisamoto et al. (IEDM 91, Hisamoto hereinafter).

With regard to the 103 rejections of claims by Kim in view of Hisamoto, Applicants respectfully submit that these claims defined over the prior art references for at least the reasons discussed above.

Further, contrary to the Office's assertion, Kim teaches stacking the storage node on the gate electrode (word line) as shown in Figures 1-2 and second paragraph. Further, the storage electrode of Kim is a plate-like structure, rather than a pillar. In addition, the storage electrode of Kim can not be construed as equivalent to the pillar of the instant case. The pillar of the instant case is the polysilicon substrate, and the inner electrode (storage node) of the instant case is a conductive layer formed inside the trench of the substrate.

Accordingly, even if Kim were combined with Hisamoto, the combination still fails to render claims 39-42, 44-45 and 50-51 unpatentable and that the pending claims 39-42, 44-45 and 50-51 are in condition for allowance. Favorable consideration and allowance of the present application and all pending claims are hereby courteously requested.

New Claim

Customer No.: 31561
Application No: 10/709,719
Docket No.: 13114-US-PA

Applicant has added claims 52-53, which is written in independent form so as to further limit the claimed subject matter define in claim 34 and 46 respectively. More particularly, claims 52-53 teaches the word line is formed intersecting with other semiconductor pillars formed adjacent to the semiconductor pillar, whereas the prior art reference Kim teaches the word line extends along the entire length of a single pillar. Therefore, it is submitted that claims 52-53 are in condition for allowance for the above reasons.

Customer No.: 31561
Application No: 10/709,719
Docket No.: 13114-US-PA

CONCLUSION

For at least the foregoing reasons, it is believed that the presently pending claims 34-36, 38-53, are in proper condition for allowance. If the Examiner believes that a telephone conference would expedite the examination of the above-identified patent application, the Examiner is invited to call the undersigned.

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Respectfully submitted,

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